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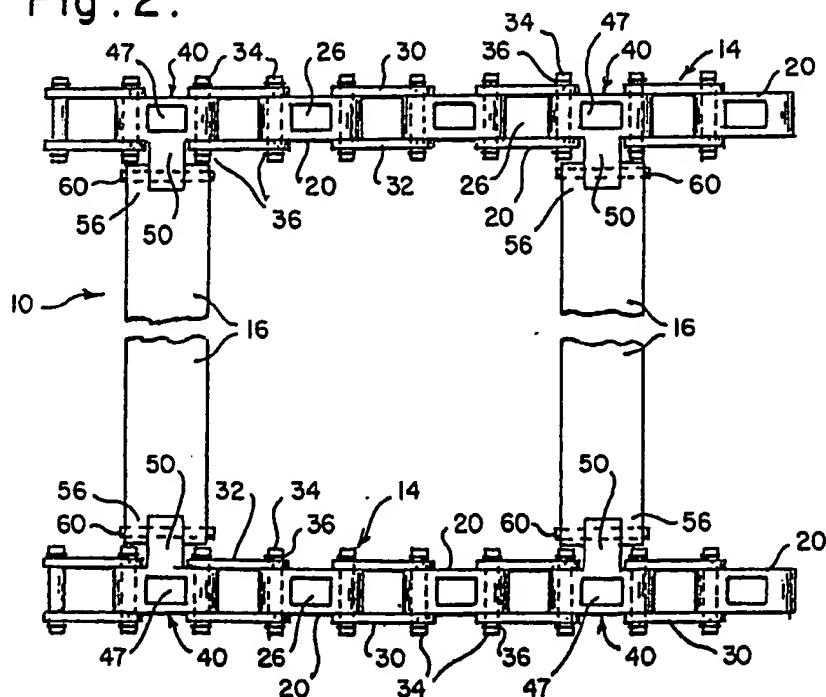
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(54) Chain and flight conveyor

(57) A chain and flight conveyor comprises a pair of spaced chains (14) interconnected by spaced flights (16). Each flight is attached to an attachment link (40) with male members (50) extending towards the other chain. The roller links have slots (26, 47) which allow the engagement of each of the roller links by drive sprockets. The flight (16) has female ends (56) which are positioned around the male extensions (50) of the roller links (40). Retaining pins (60) inserted in co-operating holes in the extension and flight end secure each of the flights (16) to the male members of the roller links. The roller links (20, 40) of each conveyor chain are connected by side plates (30, 32) and pins (34) positioned on each side of the roller link such that a slot remains between the roller links which may be engaged by the drive sprockets.

Fig. 2.



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Fig. 1.

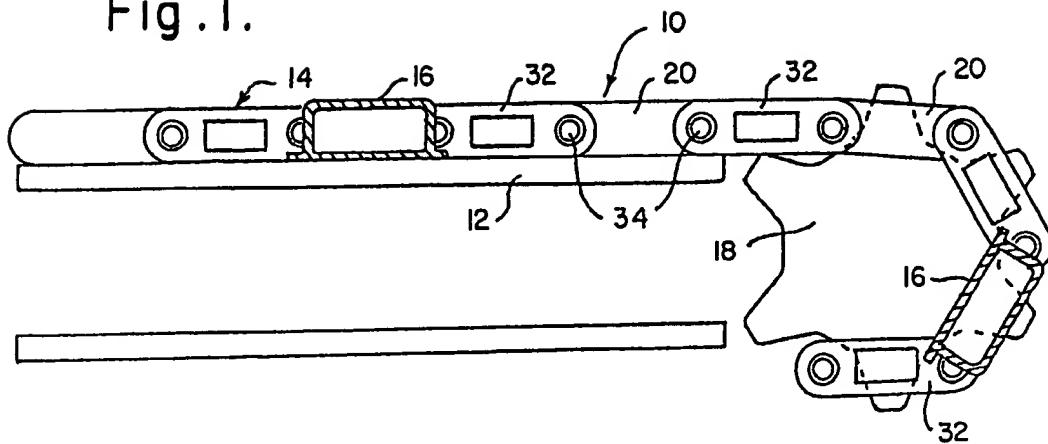


Fig. 2.

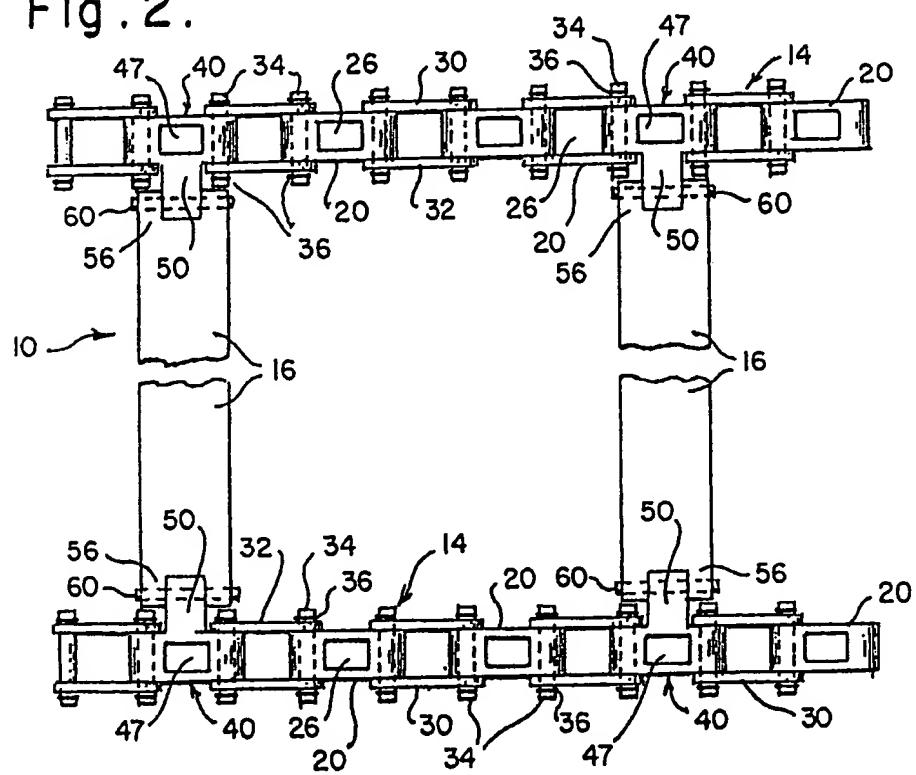


Fig. 3.

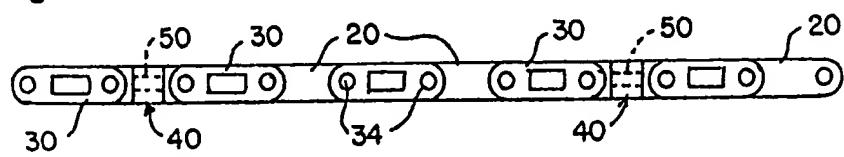


Fig. 4.

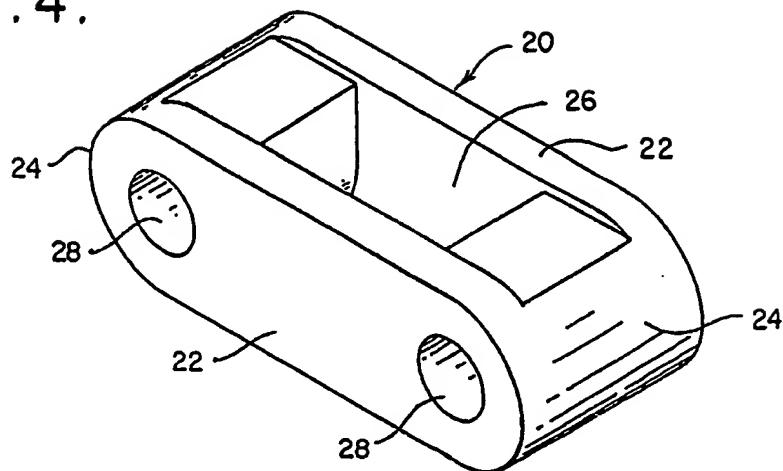


Fig. 5.

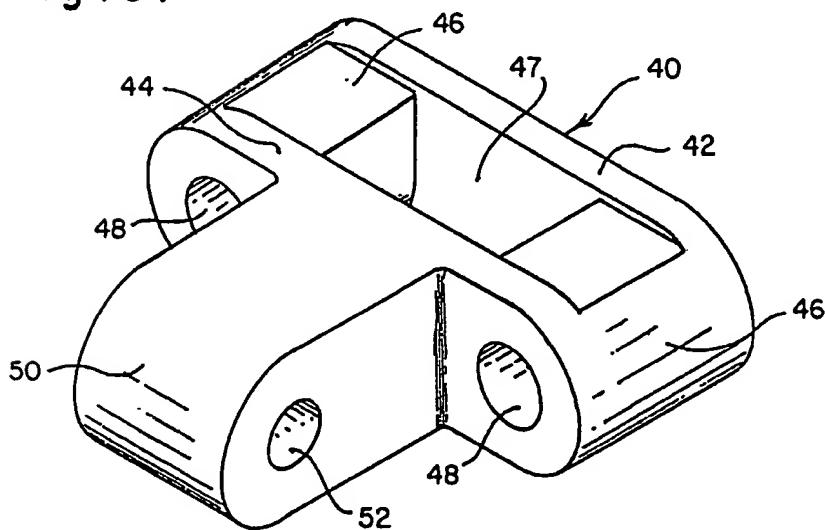
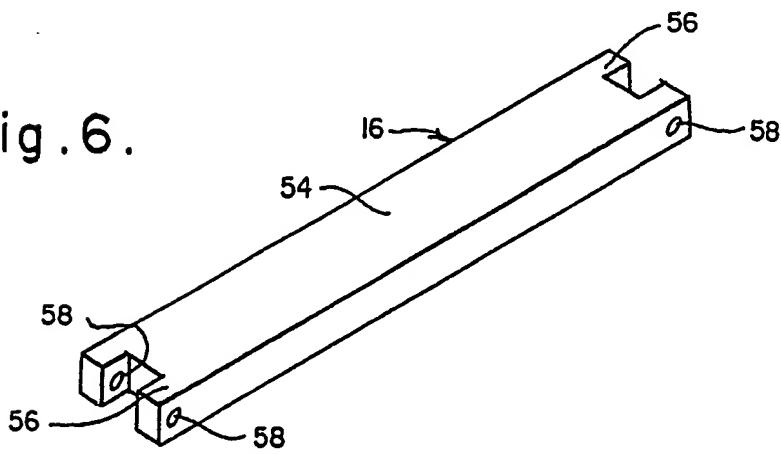
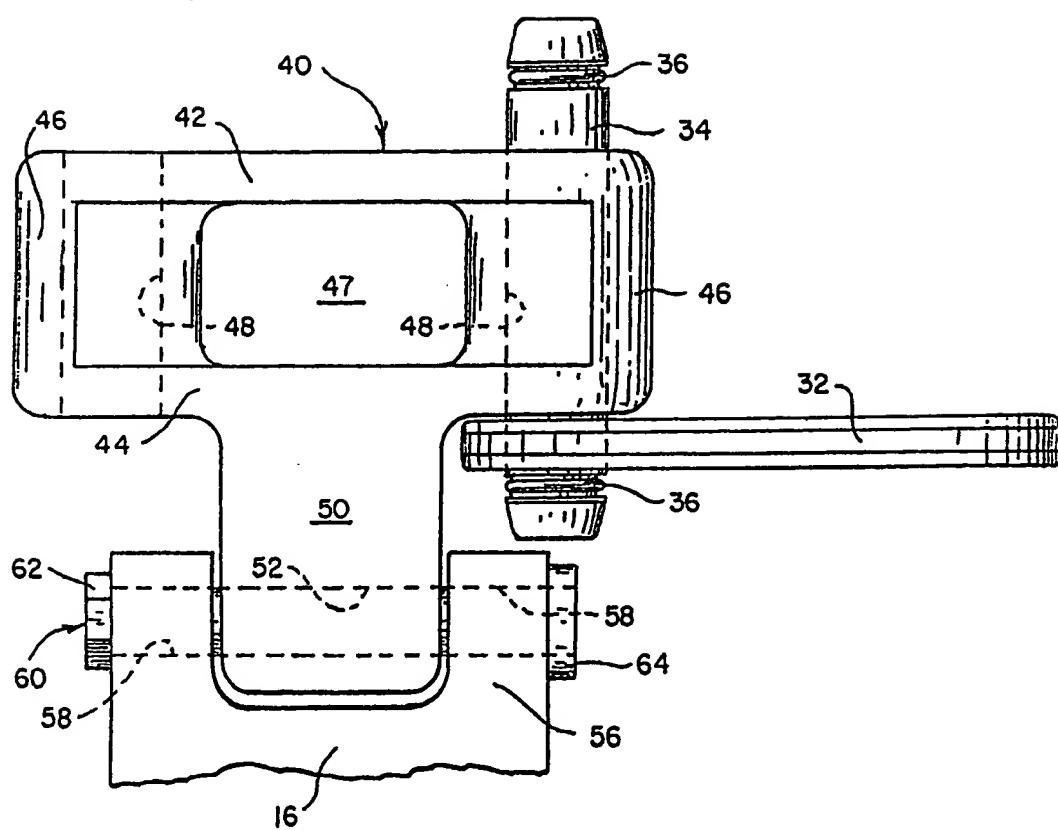


Fig. 6.



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Fig. 7.



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DESCRIPTION

CHAIN AND FLIGHT CONVEYOR

The present invention relates to chain and flight conveyors, and in particular, but not exclusively, to such conveyors for use in conveying materials in the mining industry, and particularly to an improved design for the attachment of flights to conveyor chains.

In the process of underground mining, material is removed from a seam and transferred between machines which employ conveyors. Mined material is often transported and conveyed in shuttle cars which have a flat deck and conveyor chains which are designed specifically to load and unload the material therefrom. In most applications, the conveyor chains in the shuttle cars consist of two drive chains which are positioned on the extreme outer borders of the conveying decks of the cars. The drive chains consist of roller links, which contact the drive sprockets of the machine, and connecting links which are positioned between the roller links. In addition, the conveyor chains have flights which are fixed to the two drive chains and are positioned between the two chains. These flights are usually made of steel and can be a welded, tubular design or a solid, one piece design. The conveyor chain flights are positioned along the drive chains in a spacing designed to efficiently move material in the shuttle car. The flights are usually connected to the drive chains by inserting a male member on the ends of the flights through slots which are located in the roller links of the drive chains.

The prior designs have had disadvantages in several respects. In most previous designs, attachment and removal of the flights from the conveyor chains has been difficult, many times

necessitating removal of the chain links to replace a flight. The drive chains in most prior designs must be moved from their normal operating position on the sprockets in order to connect the flights to the chains. In addition, forces experienced during the operation of a shuttle car which destroy the flights are transferred to the drive chains and often cause failures of those chains.

One prior art conveyor chain design appears in French Patent No. 665,420 issued to Naranovitch. That patent teaches of a conveyor chain in which the links include individual wheels. Certain links are designed differently and have a male extension fitting into a vertical U-shaped hinge element on the end of the flight. The attachment is secured by a pin. This patent, however, does not relate to a roller link arrangement which is driven by a drive gear. Also, the pins interconnecting the flights and the modified links are subjected to pure shear forces. Another design for a conveyor chain appears in U.S. Pat. No. 2,575,610 issued to Ball. That patent discloses parallel chains having flights with a male projection member thereof fitting into openings in predetermined chain links. This projection is slightly smaller than the opening thereby allowing for a small degree of tilt. Thus, the flight is pivotally connected to the side chains and replacement of flights requires that the chain be removed from the drive sprockets to remove a flight. Yet another design appears in U.S. Pat. No. 3,089,579 issued to Beck. The Beck patent teaches a conveyor flight with a removable, outwardly projecting male extension member which fits into openings in certain links on the chain. This extension is fastened to the flight by means of an interlocking tongue and groove mechanism fastened by bolts. As such, the flight may be removed from or attached to the conveyor chain without disturbing the chain tension or removing the entire load. However, in this

apparatus the male extension member enters the conveyor chain and prohibits engagement of the conveyor drive sprocket with predetermined links along the chain.

The subject invention is directed toward an improved design for attachment of flights to a chain and flight conveyor which aims to overcome, among others, the above discussed problems and which provides for a more useful means of flight attachment which does not require a disruption of the conveyor chain for flight replacement and which allows all roller links to be engaged by the conveyor chain drive gears of the shuttle car. This new design enables attachment of the flights to the drive chains without repositioning the drive chains from their normal operating position. In addition, the component parts are designed so that, if a flight fails, the drive chains will not fail.

In accordance with a first aspect of the present invention, there is provided a chain and flight conveyor adapted to be driven by a toothed sprocket, comprising a pair of spaced, substantially parallel driving chains, each of said driving chains comprising first links having at least one end surface which may be drivingly engaged by the teeth of said sprocket and having internal apertures defining drive surfaces which may be drivingly engaged by the teeth of said

sprocket, second links coupled to and interconnecting said first links, and a predetermined corresponding number of said first links on each of said chains comprising flight attachment links having extension members facing the opposite chain, said extension members having a bore therethrough in the direction substantially parallel to said driving chains, and a plurality of conveying flights connected between said corresponding number of said flight attachment links, said flights comprising a bar member having open-bottomed female or generally U-shaped receptacles provided on the ends thereof which are adapted to receive one of said extension members, the ends of said bar member including apertures aligned with the aperture in a corresponding extension member to receive a fastener therethrough.

In accordance with a second aspect of the present invention, there is provided a chain link for attaching a flight having female or generally U-shaped end receptacles to a chain and flight conveyor which includes two substantially parallel chains comprising a plurality of link elements, which chains are driven by toothed sprockets, said chain link comprising a body member having at least one end surface which may be drivingly engaged by the teeth of said sprocket and having an internal aperture defining a drive surface which may receive and be driven by the teeth of said

sprocket, and an extension member extending toward the opposite chain and including means for attaching one of said receptacles of said flight thereto.

In accordance with a third aspect of the present invention, there is provided a flight for a chain and flight conveyor having substantially parallel driven chains, which chains each include at least one flight attachment member extending toward the opposite chain and aligned with a flight attachment member on the opposite chain, said flight comprising an extended bar member, the ends of said bar member each comprising an open-bottomed female or generally U-shaped receptacle adapted to receive a corresponding flight attachment member and means for attaching the ends of said flight to the corresponding flight attachment members.

The present invention thus provides an improved design for a chain and flight conveyor. Two drive chains are positioned on the perimeter of a flat horizontal deck of a shuttle car used in mining operations. Flights run between the chains and sweep material along the deck. The flights are usually made of steel and can be a welded, tubular design or a solid, one-piece design.

In one embodiment, each chain includes flight attachment roller links, or block links, certain of which are provided with male members which extend inwardly toward the other chain and to which the

flights are to be attached. Each roller link has a slot allowing engagement of the roller link by the drive sprockets for the drive chain. A specially designed flight has female ends which are positioned around the male extensions of the flight attachment links. Retaining pins inserted in co-operating holes in the flights and flight attachment links secure each of the flights to the male members of the flight attachment links. The remaining roller links of each drive chain are connected by side plates and journal pins positioned on each roller link such that a slot remains between the roller links which may be engaged by the drive gears.

Accordingly, the present invention provides solutions to the aforementioned problems encountered in the utilization of chain and flight conveyors in shuttle cars. As this invention provides flight attachment links with extended male members to which the flights are attached, the problems caused by the necessity to remove or disrupt the conveyor chains to replace or repair flights are alleviated. In addition, as the present invention includes slots in the flight attachment links which may be engaged by the sprockets which drive the drive chains, the drive chains may be engaged at each roller link thereby providing smoother, more efficient operation thereof.

These and other details, objects, and advantages of the invention will become apparent as the following description of the preferred embodiment thereof proceeds.

By way of example only, a specific embodiment of the present invention will now be described, with reference to the accompanying drawings, in which:

Figure 1 is a side view with partial cut away of an embodiment of shuttle car conveyor chain with flights in accordance with the present invention, and showing the drive sprocket engaging the chain;

Figure 2 is a plan view of an assembled section of the flight conveyor chain of Fig.1 with two flights attached;

Figure 3 is a side view of a section of the conveyor chain of Fig.1;

Figure 4 is a perspective view of a block or roller link of the assembly of Fig.1;

Figure 5 is a perspective view of a roller or block link of the assembly of Fig.1, with the extending male member;

Figure 6 is a perspective view of a flight of the assembly of Fig.1, with female ends; and

Figure 7 is a plan view with a partial cut away view of one unit of the assembled flight conveyor mechanism of Fig.1.

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Referring now to the drawings wherein the showings are for purposes of illustrating the present preferred embodiments of the invention only and not for purposes of limiting same, the figures show a chain and flight conveyor assembly, generally designated as 10.

More particularly and with reference to Figure 1, there is shown a conveyor chain 10 which may ride along a conveying deck 12 of, for example, a shuttle car. As shown in Figure 2, the conveyor chains 10 consist of two (2) drive chains 14 which are positioned on the extreme outer borders of the conveying deck 12 of the shuttle car and are connected by flights 16. Flights 16 ride along the deck 12 to sweep mined material therealong. A drive sprocket 18 of the shuttle car drivingly engages each drive chain 14 at each link thereof as described hereinbelow.

Each drive chain 14 includes a plurality of links 20. As shown in Figure 4, links 20 are preferably provided in the forms of roller links or, more preferably, block links which are unitary links having spaced longitudinal side members 22 and spaced lateral cross members 24 which define an open area 26. As such, block links 20 may be engaged by a sprocket 18 on the outer surfaces of the lateral cross members 24 as well as in the open area 26. The cross members 24 are additionally provided with lateral bores 28. As shown in Figure 2, in the drive chains 14, the block links 20 are interconnected by outer side plates 30 and inner side plates 32 by means of journal pins 34 which are retained by retaining rings 36.

At predetermined intervals along the length of each of the chains 14, the block links 20 are replaced by flight attachment links 40 to which the flights 16 are attached. For example, preferably every third block link 20 along each chain 14 is replaced with a flight attachment link 40. As shown in Figure

5, flight attachment links 40 each include an outer side member 42, inner side member 44 and lateral cross member 46 thereby defining an open space 47. Such open spaces 47 may also be drivingly engaged by the sprocket 18. Lateral bores 48 are provided in cross members 46. In addition, laterally inwardly (as taken toward the opposite chain 14) extended male attachment members 50 are provided on each inner side member 44 of flight attachment links 40. A bore 52 is provided in attachment member 50 and extends parallel to the length of chain 14.

With reference to Figure 6, there is shown a flight 16 which may comprise a solid element or, alternatively, may be of a welded tubular design. The flight 16 includes a bar member 54 having U-shaped female receptacles 56 on each end thereof. Aligned bores 58 are provided in the sides of each receptacle 56 and are parallel to the length of the chain 14. Each flight 16 is attached to a corresponding flight attachment link 40 on each chain 14. As shown in Figure 7, such attachment is accomplished by means of fasteners 60, such as bolts 62 and nuts 64, passing through the bores 58 in the receptacle ends 56 of the flights 16 and through the bores 52 in the attachment members 50.

In the operation of the present invention, the conveyor chain-flight assembly 10 may be assembled as a unit or may be assembled as discrete chains 14 which are installed on a shuttle car with the flights 16 being installed later. Due to the attachment mechanism disclosed herein, the flights 16 may be installed or removed when the chains 14 are under tension from sprockets 18 and without disrupting either chain 14. Also, due to the designs of the block links 20 and flight attachment links 40, the sprocket 18 may engage each lateral

link of the chains 14 thereby affording smoother, more reliable operation.

It will be understood that various changes in the details, materials and arrangements of parts which have been herein described and illustrated in order to explain the nature of the invention, may be made by those skilled in the art within the principle and scope of the invention as expressed in the appended claims.

CLAIMS

1. A chain and flight conveyor adapted to be driven by a toothed sprocket, comprising a pair of spaced, substantially parallel driving chains, each of said driving chains comprising first links having at least one end surface which may be drivingly engaged by the teeth of said sprocket and having internal apertures defining drive surfaces which may be drivingly engaged by the teeth of said sprocket, second links coupled to and interconnecting said first links, and a predetermined corresponding number of said first links on each of said chains comprising flight attachment links having extension members facing the opposite chain, said extension members having a bore therethrough in the direction substantially parallel to said driving chains, and a plurality of conveying flights connected between said corresponding number of said flight attachment links, said flights comprising a bar member having open-bottomed female or generally U-shaped receptacles provided on the ends thereof which are adapted to receive one of said extension members, the ends of said bar member including apertures aligned with the aperture in a corresponding extenison member to receive a fastener therethrough.

2. A conveyor as claimed in claim 1, in which said fastener comprises a nut and bolt combination.
3. A chain link for attaching a flight having female or generally U-shaped end receptacles to a chain and flight conveyor which includes two substantially parallel chains comprising a plurality of link elements, which chains are driven by toothed sprockets, said chain link comprising a body member having at least one end surface which may be drivingly engaged by the teeth of said sprocket and having an internal aperture defining a drive surface which may receive and be driven by the teeth of said sprocket, and an extension member extending toward the opposite chain and including means for attaching one of said receptacles of said flight thereto.
4. A flight for a chain and flight conveyor having substantially parallel driven chains, which chains each include at least one flight attachment member extending toward the opposite chain and aligned with a flight attachment member on the opposite chain, said flight comprising an extended bar member, the ends of said bar member each comprising an open-bottomed female or generally U-shaped receptacle adapted to receive a corresponding flight attachment member and means for attaching the ends of said flight to the corresponding flight attachment members.

5. A chain and flight conveyor substantially as hereinbefore described, with reference to, and as illustrated in, the accompanying drawings.

6. A chain link substantially as hereinbefore described, with reference to, and as illustrated in, the accompanying drawings.

7. A flight for a chain and flight conveyor, substantially as hereinbefore described, with reference to, and as illustrated in, the accompanying drawings.

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